

Process improvement in an Industry using Value Stream Mapping Approach

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Abstract: Process Improvement is the proactive task of identifying, analyzing and improving upon existing business processes within an organization for optimization and to meet new quotas or standards of quality. Value Stream Mapping (VSM) is the process of mapping the material and information flows required to coordinate the activities performed by manufacturers, suppliers and distributors to deliver products to customers. VSM is a mapping tool that maps not only material flows but also information flows that signal and control the material flows. Value stream mapping is considered to be efficient tool of lean manufacturing .Value stream mapping captures the information at existing point and takes the cycle time, uptime or utilization of resources, setup time, WIP inventory, manpower requirement and the information flow. Then it reads the values after a futuristic state is implemented. Thus improving the current state better than old state. This Paper details the use of the value stream mapping in reducing waste in manufacturing Company. This research provides a case study performed in a piping industry. A Case study in a one of the pipe manufacturing industry, the production process path is visualized by mapping the current state value stream map. After the carefull analysis of entire process, the various wastages are identified and the causes are analyzed. A Future state value stream map is put forwarded and ideas for improvement are suggested. It is seen that the suggested improvement ideas the customer supply is reduced from 29 days to 16 days. Value Stream mapping is proved as a useful technique to minimize the cycle time and increase the Production.

Keywords: value stream mapping, inventory, lead time, kanban

1. Introduction

A process is no more than the steps and decisions involved in the way work is accomplished. Even without Changing the process flow, speed can be injected into the system doing the away with the costs of waiting, and the resulting confusion by simply streamlining and debottlenecking the flow by reorganizing the flow of work. The current business environment has placed an increased focus on operational efficiencies while maintaining a high level of quality and innovation excellence. With manufacturing becoming a more and more competitive market, companies globally strive to increase their efficiency. Value Stream mapping technique involves flowcharting the steps, activities, material flows, communications, and other process elements that are involved with a process or transformation. Companies are experiencing intense competitive pressure due to globalization hence they cannot afford to operate with waste in their processes. A value stream is all the actions (value-added and non-value added) required to take a product from raw material to the customer, the design flow from concept to completion. Value-added activities are considered the actions and the process elements that accomplish those transformations and add value to the product from the perspective of the customer .Non-value-added activities are the process elements that do not add value to the product from the perspective of the customer such as setting up, waiting for materials, and moving materials.

2. Case Study

2.1 Problem Statement

Few of the small scale units graduate in to a middle scale industry with a variety of functions and activities closely knit into organizational network following a set of objectives. Although lean manufacturing is becoming a popular technique for Productivity Improvement. The case study is carried out in a medium scale industry namely star pipes ltd. to achieve certain tangible and intangible benefits. If the shop floor is the well spring of Competence, it is also a den of vice and waste is its king. To promote the use of lean manufacturing within the company is the challenge. Its focuses on the addressing identified manufacturing Problems through the application of selected lean tools. The entire process from raw material entry tocustomer is studied. While studying the entire process from different departments it is clear that delivery to customer consists of a Problem. Each process for manufacturing the pipe is piled up with jobs and this has been consistently noted for the past few months regularly. Even after working for a more time rather than shift time, the assignment doesn't seem to cease.. The lead time required to complete is high and it is 29 days. The work-place seems cluttered with work

all over the working area. Therefore, there is enough scope for streamlining and debottlenecking the process flow. The aim is to reduce the lead time and to deliver products to customer with in time.

2.2 Methodology Adopted

Main objective is to achieve cycle time reduction by employing the following steps:-

Step I) To draw a Current State Map by using following sub steps:-

Substep I) Identification and Drawing the Product flow from the raw material entry point of the Manufacturing division (MFD) to the finished goods exit point of the MFD.

Substep II) Calculating the number of Work in Process (WIP) for each component at each work cell.

Substep III) Calculating the cycle time and utilization percentage of each process.

Substep IV) Plotting the current State Map that is essentially a Snapshot capturing how things are currently being done.

Step II) Create a Future State Map, Which is a Picture of how system should look after the inefficiencies in it have been removed.

2.3 Current State Map

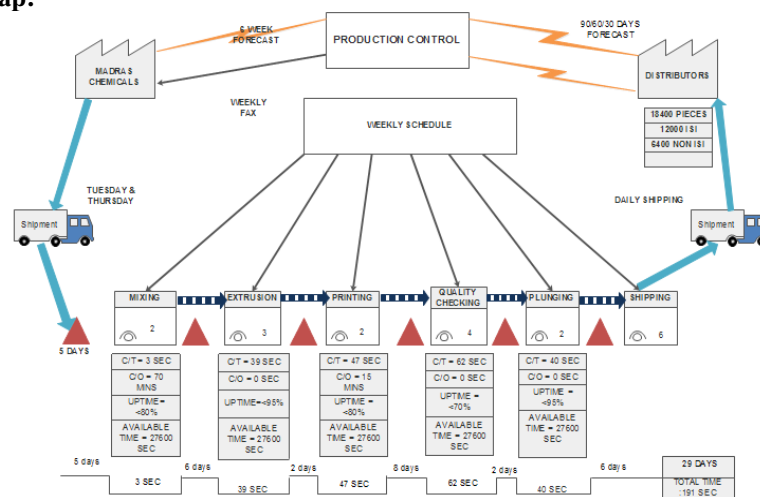
Data Collecting Method:

Method that will be used in collecting data needed is observation to the activities that performed in the production shop floor. We gone through the manufacturing facility and identified each operation process involved from raw materials to finished goods, identified all the places where inventory is stored between the processes, and observed how the material flows from one operation to another. Statistical data collection methods for measuring machine setup time were used in this study to summaries and describe the data.. The data was collected by using a stopwatch. Based on the actual production, data was collected and recorded on a daily basis.. These methods helps to identify the main contributor to high time loss and help to visualize and better understand the root causes and finding possible solutions to the problems.

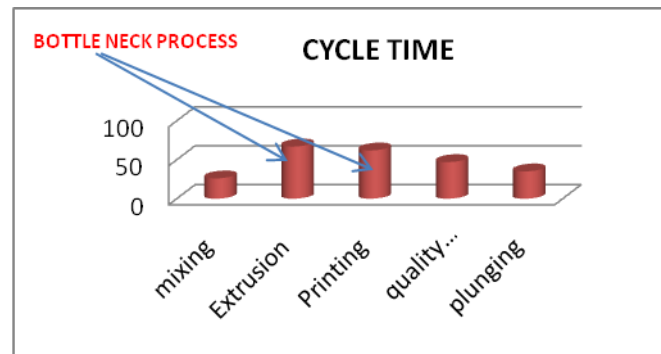
2.4 Analysis of a Current State Map

Readings	Mixing	Extrusion	Printing	Q.C	Plunging
Time 1	3 sec	27sec	47 sec	62 sec	40 sec
Time 2	4 sec	42 sec	49 sec	65 sec	42 sec
Time 3	3 sec	40 sec	47 sec	63 sec	41 sec
Average time	3 sec	39 sec	47 sec	62 sec	40 sec

2.5 current state map:



2.6 Cycle Time Graph



From The Graph it is clear that the Cycle time required for extrusion and printing is Highest. Also it is noted that the idle time for inventory is found to be 29 days which it takes to supply to the customer. While reviewing the entire process piling up of materials after each process is themainhurdle in meeting customer requirements jobs. The entire operations for manufacturing pipes as per the customer requirement of 18600 pieces takes an 29 days to complete it

2.7 Proposal for the Future State Value Stream Mapping

Having Visualized the Current State Map of aindustry, identified the Wastages and associated Problems, some of the necessary Changes in the value Stream of pipe manufacturing were outlined in the draft of the future state map.

Production Processes:-

- 1) Mixing
- 2) Extrusion
- 3) Quality checking
- 4) Printing
- 5) Plunging
- 6) Shipping

3. Methodology Eliminate the Techniques

1. Implementing pull system
2. Implementing supermarket system for each processes
3. Application of kanban systems
4. Adopting machine flexibility for Extrusion and Printing

Following Are the Wastes Which Has Significant Impact on the Performance of the Piping manufacturing:

1. High Waiting Time:

Every stage has considerable waiting time which can be reduced. Extrusion and printing stages are facing maximum waiting time. Transportation from one place to the respected machine is the main waiting time causing factor faced in the current state

2. Unnecessary Motion :

Operators walk across the length of entire production floor multiple times, there is a distance about 600 meters. During every process the prescribed workers has to move ad around every place for several job and to take care of each and every process

3. over production:

Over production is the other main problem faced by star pipes in current situation since they are not aware of the products to be manufactures, since the push system is being practiced in star pipes, goods are being overloaded in every stages and finally huge lump of finished goods are being staked

Ways to remove waste:

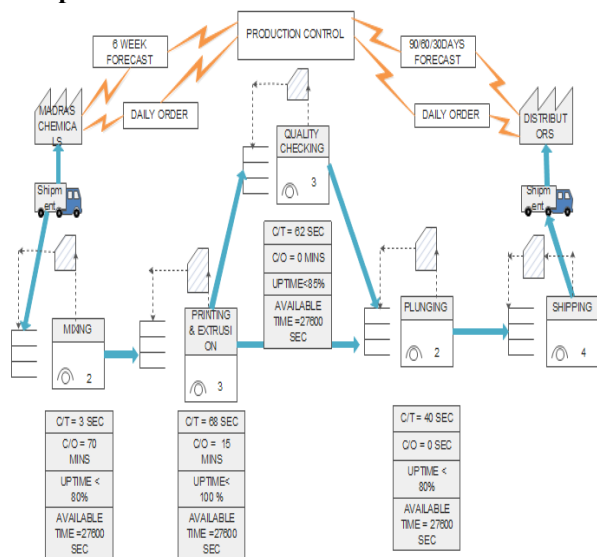
- 1) Reduce set up time
- 2) Follow machine Flexibility for extrusion and printing machines
- 3) Employ supermarket and Kanban system
- 4) To avoid searching time and to reduce waiting time to the machines

5) Quality checking has to be performed only for ISI pipes

4. PROPOSED CURRENT STATE MAP

The current state value stream map is analyzed and the pitfalls are analyzed and recommendations are put forward. a pilot study is being conducted on machine flexibility for extrusion and printing also some recommendations are made for each process. The recommendations are to place supermarkets for every process and also machine flexibility is made for the extrusion and printing process since most of the times are being wasted for these two processes. The recommendations are to place supermarkets for every process and also machine flexibility is made for the extrusion and printing process since most of the times are being wasted for these two processes.

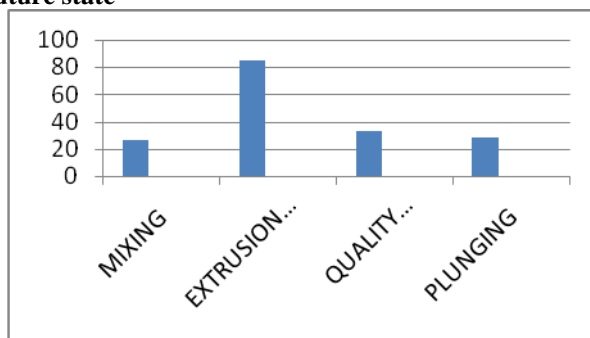
4.1 Proposed Future State Map



4.2 Cycle Time Chart For The Proposed Future State

Readings	Mixing	Extrusion & Printing	Quality checking	Plunging
Time 1	3 sec	68sec	62 sec	40 sec
Time 2	4 sec	70 sec	65 sec	42 sec
Time 3	3 sec	68 sec	63 sec	41 sec
Average time	3 sec	68 sec	62 sec	40 sec

4.3 cycle time graph for future state



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5. Results and Conclusions

It was observed that, due to enormous potential in the lean manufacturing tools, value stream mapping study was carried out in a medium scale industry. By creating current state value stream map, the non-value added activities in the production process are visualized and identified. A future state value stream map is created with the waste activities eliminated. With the future state value stream map, the inventory delay time is significantly shortened from 29 days to 16 days representing a reduction. Value stream mapping is proved as a useful technique to shorten delivery time and reduce production costs

5.1 Comparison of Current and Proposed Future State V.S.M

Process	Comparison								
	Time			Manpower			Inventory		
	Current	Future	Savings	Current	Future	Savings	Current	Future	Savings
Mixing	3 sec	3 sec	0 sec	2	2		5 days	2	3 days
Extrusion & Printing	74 sec	68 sec	6 sec	5	3	2 Persons	8 days	5	3 days
Quality checking	62	62	0 sec	4	3	1 person	8 days	5	3 days
Plunging	40 sec	40 sec	0 sec	2	2		2 days	1	1 day
Shipping				6	4	2 Persons	6 days	3	3 days

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6. Conclusion

On the Shop floor time is money. On the shop floor need is elimination of wastages and delays. It helps in mapping the process it manifests itself as the objective of designing a process for which manufacturing is a low cost process. Value Stream mapping helps in attaining higher usage levels by the proficiency of shop floor practices aimed at increased human and machine productivity and thus improving the process. Approach is only that do just what you are doing -do it quicker and by extension, cheaper. The goal of it is to identify, demonstrate and decrease activities that add no value to the final product. Value stream mapping, primarily a communication tool, but also is used tool as a strategic planning tool, is a kind of technique that helps to understand and streamline production processes. By applying the Value Stream mapping tool in a pipe manufacturing industry, a current state map is developed. A future state value stream map is created by eliminating non value added activities. The future state value stream shows marked improvement in the process and the customer supply time is reduced from 29 days to 16 days resulting in improvement. A case study discussed outlines importance of Value Stream.

7. References

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